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IN THE UNITED STATES DISTRICT COURT OUT 29 1575 FOR THE NORTHERN DISTRICT OF ILLINOIS

EASTERN DIVISION

H. Stuart Cunningham, Clark

United States District Court

THE MAGNAVOX COMPANY, a Corporation, and SANDERS ASSOCIATES, INC., Consolidated Civil a Corporation,

: Actions No. 74 C 1030

No. 74 C 2510

Plaintiffs, :

DEPOSITION OF

CHICAGO DYNAMIC INDUSTRIES, INC., a Corporation,

: BERNARD J. LECHNER

Defendant. :

Transcript taken in the above-entitled matter before Guy J. Renzi and Edwin Silver, Certified Shorthand Reporters and Notaries Public of the State of New Jersey at 824 West State Street, Trenton, New Jersey on Thursday, October 28, 1976, commencing at 9:15 A.M.

APPEARANCES

MESSRS. NEUMAN, WILLIAMS, ANDERSON & OLSON Attorneys on behalf of Plaintiffs THEODORE W. ANDERSON, ESQ. and JAMES T. WILLIAMS, ESQ.

JOSEPH S. TRIPOLI, ESQ. Attorney on behalf of RCA

MELVIN M. GOLDENBERG, ESQ. Attorney on behalf of Seeburg Industries, Inc. and Worldwide Distributors, Inc.

EDWARD C. THREEDY, ESQ. Attorney on behalf of Chicago Dynamic Industries

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WITNESS BERNARD J. LECHNER Direct examination by Mr. Goldenberg.... Cross-examination by Mr. Anderson..... Redirect examination by Mr. Goldenberg... Recross-examination by Mr. Anderson.....

DIRECT EXAMINATION BY MR. GOLDENBERG:

Q Mr. Lechner, would you state your full name as you ordinarily use it in business and your residence address, please?

A Yes. My full name as I ordinarily use it is
Bernard J. Lechner and my residence address is
Cleveland Road, Rural Delivery 2, Princeton, New
Jersey.

- Q Are you employed, sir?
- A Yes.
 - Q By whom?
- A By the RCA Corporation.
- Q How long have you been employed by RCA?

 A Since June of 1957.
- Q Could you state your education after high school naming institutions that you attended, the years that you were there, major courses of study and degrees received, if any?

A I graduated from New Rochelle High School in June of 1949 and entered MIT as a freshman in the fall of 1949. I was at MIT for one semester, the fall of '49, until January of 1950. I returned

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to MIT in the fall of 1950 and was there for one full academic year until the summer of 1951, would that be -- yes, the fall of '50 to the summer of '51.

I then entered Columbia University in the fall of 1952 and was there for one semester, at which point I went into the Army.

When I returned from the Army in January of 1955 I re-entered Columbia and was a student there continuously until the summer of 1957 when I received my Bachelor of Science Degree in Electrical Engineering.

and 1960 I was a part-time student at Princeton
University. Part-time from '57 through '59, and
then essentially full-time on leave of absence from
RCA -- no, I wasn't really on leave of absence,
it was a special program. I guess I was still
carried as a full employee but I was not being paid
full salary. I was receiving partial salary during
that year from 1959 to 1960. And I studied, did
graduate work in electrical engineering from Princeton,
but I have no degrees from Princeton.

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What was your experience while you

were in the Army?

A I entered the Army as a draftee, so as a

Private E-1, went through basic training at Camp Gordon, Georgia, which at that time was one of the principal basic training sites for people who were destined to be members of the Signal Corps.

After completing the basic training period in the spring of 1953, I was transferred to Fort Monmouth, New Jersey, with the intention that I would take a 33-week, or 39-week--33- or 39-week signal school course in microwave radio repair, I think was the title of the program. However, since I had some advance knowledge of electronics, having worked with electronics as a hobbyist through high school and having studied electrical engineering at MIT, and also having worked as as television serviceman during the period between 1949 and 1953, when I was not a student, I was able to obtain an advance standing in that course by taking the weekly examinations for the first 25 or 27 weeks, or something of that order. And so I entered the course not at week one, but at week 20-something--I don't remember exactly where it was. And after completing the remaining eight or ten weeks, whatever the exact

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number was, I became an instructor in the signal school at Fort Monmouth and taught that same course, or taught portions of that same course. I taught different weeks at different times. The practice was that an instructor taught one week and started the same week over again the following Monday morning. But I didn't teach the same week the entire time, until the end of 1953.

In December of 1953 I was transferred to the 315th Signal Battalion Headquarters, in Karlsruhe, Germany, and spent the rremainder of my army career there, another year, from January of '54 to January of '55, when I was honorably separated from the service. And what I did there initially was to take a short course that was offered on some specific equipment that the 315th Battalion maintained in Germany and France. This was a microwave telephone link system that ran all over Western Germany and parts of France.

After taking that course and participating in a field maneuver that related to that kind of equipment, I became an instructor in that school; and for the remainder of that year, from I guess sometime in March or April of '53--March or April of '54 until January of '55, I taught that course in

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record, surely.

[Off the record.]

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My duties are to supervise the research activities of between 20 and 25, I don't again remember the exact number of members of the technical staff, and approximately an equivalent number of supporting research technicians, research associates and technical staff associates.

And this is in connection with color television development?

- That's correct.
 - Generally?
- That's correct. A
- Were you employed by RCA in the calendar year 1967?
- Yes, I was.
- Could you tell us what position you held at that time and generally what your duties were? And if they changed in the course of the year, could you so indicate?
- Yes. At the beginning of that year I was the head of a group concerned with doing research on digitally addressed matrix displays. And I don't remember the exact title of the group, but it probably included the words display or matrix -no, probably display and maybe digital.

At that time I reported to Dr. Ian Rajchman

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and the laboratory that he headed was called, if I remember correctly, the Computer Research Laboratory. It may have been Computer Systems, but approximately Computer Research Laboratory.

Sometime during the summer of 1967, and again I do not remember the exact date, we had a reorganization at the laboratories and a new laboratory was created called the Computer Applied Research Laboratory, and the other computer laboratory, which I imagine remained known as the Computer Research Laboratory, continued under Dr. Rajchman; but this new laboratory was headed by Dr. William Webster who was the Acting Director of that laboratory at that time.

And I and my group moved from Dr. Rajchman's laboratory to Dr. Webster's laboratory. And I believe the title of the group was changed. It may not have been changed at exactly that moment, it may have been changed later in the year, to the Peripheral Equipment Research Group.

- How do you spell Dr. Rajchman's name? Q R-a-j-c-h-m-a-n.
- Could you tell us what digital address matrix displays are?
- They are displays which have, in the A

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context that I used the term before anyway, they are displays that have a rectangular array in general, or in general an orthogonal array since it could be rho and theta, as well as X and Y, having at each point a discreet element capable of producing light.

Those elements being addressed or controlled by the coincidence of orthogonal signals applied to, for example, the X and Y lines. It is a display that is electrically organized very much like a computer memory in that the individual points are excited only when there is coincidence of signals on the two orthogonally exposed addressing lines.

There are many examples of those kinds of displays that have been worked on at RCA and many other companies over the years.

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Could you give some examples, sir?

One example would be a faro electro-A luminescent display which we worked on during the period from the early 1960's until about 1966. This was a display that had 1200 discreet electroluninescent patches; they were approximately a quarter of an inch square. Each controlled by a faro electric element, and those faro electric elements arranged in a matrix of 30 by 40 elements and addressed by those seventy sterile leads. This display was constructed under an Air Force contract and was capable of producing a moving half-tone image generated by a TV camera.

MR. TRIPOLI: Off the record.

[Discussion off the record.]

Could you describe briefly any other types of digitally addressed matrix which you are familiar with in this period 1967?

There had been some 10 years earlier a matrix A display also using electro-luminescent elements that was controlled by magnetic elements. That was also 1200 elements and it was also done at RCA Laboratories.

When there was this reorganization in Q 1967 and your group had the title changed to something

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involved in peripheral equipment, was there any change in the areas of technical or scientific inquiry that you were doing at that time; or was it still this digital address matrix displays?

A No, there was a change. The intent--one of the intents of that reorganization was to broaden the scope of the activities in which my group participated to include other things besides the digitally addressed matrix displays, although we continued to work on them, too.

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Did your group have any responsibilities for investigations into any other kind of displays? There was a project that had been begun before this reorganization. But at the time of the reorganization, that project came under my supervision and it was concerned with using a storage type tube in a computer peripheral type display.

Was this storage type tube of the Q generic group that we would call a cathode ray tube?

Yes.

What generally was the purpose at that time in investigating the use of that type of tube? The purpose was to provide a computer peripheral that would allow interactive graphics.

Interactive between what and whom, sir? Well, between the user, who might be an engineer, or businessman, depending upon the particular application, and the computer which was to contain some data base relating to whatever problem or application that the user was attempting to pursue.

Were you or somebody working for you Q personally involved in that particular activity?

A Yes. People working for me were personally involved, and I was involved as a supervisor.

Q Could you tell us who those people were, sir?

A Yes. The principal people involved in that program were James Miller, James C. Miller and Charles M. Wine, and -- well, those were the principal people. There were some other people who may have had minor temporary involvements.

- Q This wasin 1967?
- A And prior, yes.
 - Q And prior.

A They came under my supervision duruing 1967, but they had been working on that project for sometime earlier.

Alfred Teger was also involved in activity with respect to a cathode ray tube and graphics. Is the activity you have just described with respect to your groups a separate activity from that of Mr.

- A Yes, it was a separate activity.
 - Q When did this activity begin?

MR. TRIPOLI: Excuse me. This activity? Which one of the two activities?

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Lechner - direct

The activity under your supervision with respect to the storage type tube.

(Off the record.)

I can't remember exactly when that began. work was certainly underway during 1966. It may have begun earlier than that. It may have begun in 1965, but I am not certain. I'd have to dig into some things, talk to some people to find out exactly when.

In the course of this investigation, what kind of device was supplying input information to the storage tube?

The input information originated in a time-share computer and came via a telephone line to some terminal electronics, which were electronics that had been designed by the people working on that program, principally Mr. Miller and Mr. Wine.

The terminal electronics interpreted the signals from the computer and generated the necessary X, Y and Z signals for the storage tube.

What was the nature of the scanning in the Q storage tube?

MR. ANDERSON: I object. There is no foundation for that question whatsoever. There has been no discussion of scanning of a

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storage tube, that I know of, in this record.

Q In order to display the information, did the storage tube include an electron beam?

A Yes, it did.

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Was that beam scanned over the screen or face of the storage tube?

The beam was moved from one point on the face of the tube to another point, from one set of XY Coordinates to another set of XY coordinates in response to signals applied to the deflection electrodes of the storage tube.

Do you know of any particular term used in the art to describe that method of moving an electron beam?

Basically it is what you would call a pointto-point or a vector-type of display.

What kind of displays were being dis-What was their nature? I am not talking played? about the device itself, but what typically was being displayed on the face of this tube? Many things. I will give you two or three examples.

Alpha numerics were created, that is, alphametic and numeric characters by making the beam trace out the specific form of the character. Also graphical entities, things that one might typically find in engineering drawings, for example. Graphs of mathematical equations. Bar graphs that might be related to business type applications.

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Sort of demonstrate to the layman the capability of the display to produce complex graphics. And to demonstrate the interactive nature, again to the

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layman, some simple games were programmed to be shown

on the display.

Q Could you tell us what those games were, sir?

The one that I remember specifically was a maze type game. The display created a rectangular box and the object from the interacting player's point of view was to move from the lower left-hand corner to the upper right-hand corner by either moving horizontally or vertically without running into any walls of the maze, but the walls were not presented to him when he started, so he had to make a guess, for example, in the lower left-hand corner whether to move up or whether to move to the right. If there was a wall above him, he would hit it and lose a If there was a wall to the right, he would point. hit it and lose a point. If there were not a wall, a line would be drawn on the face of the screen indicating that he had successfully moved from that point to a point one unit above or one unit to the right of his starting point, and he then had to make

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another guess, and so forth. And the scoring of the game was determined by how many false steps he had taken before he reached the final point.

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There were various ways of doing it. There was also a time out arrangement. There were cases where the walls would be drawn in. There were many different ways in which the actual interaction occurred, but the basic object of the game was to work one's way through this invisible maze.

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Q Was the maze ever displayed on the face of the tube?

A Oh, yes.

A Them was more than one condition under which the maze could be displayed, depending on whether one had chosen the easy or the hard modes of playing the game.

I'm trying to remember exactly how one of those modes worked.

If my recollection is correct, in one case when you hit a wall, the entire maze up to that point would be drawn for you and then erased and you would be put back to the beginning and had to remember what you had seen of the maze thus far.

certainly, when the game was completed, the entire maze would be drawn to show you whether you had taken the only path or the simplest path or the more complicated path.

Some of the mazes had more than one path possible from beginning to end.

So there were several conditions under which the entire maze could be displayed.

Q How was the movement of the player represented on the face of the tube?

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Lechner - direct

By the drawing of a line segment from the point, starting point that he had been at to the new point that he chose, whether it be above, the right, to the left or below the point he started from.

Would this be a correct understanding, is the player --

MR. ANDERSON: I object to your stating on the record your understanding. Ask the witness questions and he will answer them.

I don't think the record is concerned with your understanding of the facts, it is the witness's understanding.

MR. GOLDENBERG: I think that's what we have, sir, and I am trying to see if my characterization of it is correct. If the witness disagrees, he will so state.

MR. ANDERSON: I do not think it is appropriate for you to characterize his testimony and I object to it.

MR. GOLDENBERG: I don't think it is inappropriate at all. If it is inaccurate, it is certainly inappropriate and I will be corrected by the witness.

MR. ANDERSON: I object to your stating on the record your understanding of the testimony

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or the facts, whether your understanding is correct or incorrect.

MR. GOLDENBERG: I think you are wrong, Mr. Anderson. My sole purpose here is to attempt to save time for all of the parties involved because of the constraints above us. If you want me to do it another way and a longer way, that's what we will do.

MR. ANDERSON: I do want you to do it another way other than stating your understanding.

MR. GOLDENBERG: Well, we will try another way, sir.

Read back the last answer.

(The last answer reread by the reporter.)

As the player moved across the screen, were line segments continued to be drawn in accordance with the path of the player?

Yes A

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Q If the player moved horizontally, would there then be a horizontal line segment drawn?

A That's correct. The player would choose one of the four directions in which he wished to move,

up, down, left, or right, by pushing one of four

keys on a typewriter keyboard, in general, or a

small button box that had an equivalent function.

And in response to that, a line segment would be

drawn in one of those four directions, would then

make another choice, and the process would be

repeated, unless he hit one of the invisible walls.

Q Did the player have any control over the length of this line segment each time he pushed a button?

A No. The line segment was of a fixed length.

If he wanted to move a further distance in the same direction which he had chosen, how could he do that?

A By re-entering the same command. If he had moved to the right, let's say, by pushing the key at that time requested that motion, he would simply push it again and there would be another line segment drawn in that same direction.

O Suppose a player succeeded in going from one corner to the other corner to win the game?

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What then would he see on the face of the cathode ray tube?

> MR. ANDERSON: I object to this question and the line of inquiry as being outside the scope of the testimony that you were authorized to take by Judge Grady's order, outside of the scope of the subpoena and the notice, and irrelevant.

MR. GOLDENBERG: The order by Judge Grady, that I don't think either one of us have seen yet in written form, is, as I recall it, on the day on which he authorized the taking of this discovery was an authorization to the parties to take discovery with respect to RCA activities, and that's precisely what we are doing; and clearly, it is most relevant to the issues in this lawsuit and I believe appropriate.

MR. ANDERSON: Well, I don't know to what you are referring. All I have is a copy of your notice of taking deposition, which I understood was the basis on which you moved for leave to take this discovery. And it refers specifically to an open house, its nature and purpose, "any documents describing

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the playing of a game of pool on a cathode ray tube in conjunction with any apparatus used to generate and permit manipulation of the symbols on the screen of the cathode ray tube, including those that describe what that apparatus was and how it works," and that's the end of the quote from the subpoena which I understand you caused to be issued, which also is the basis of the notice of taking depositions and the permission granted by the Court to proceed here today.

I suggest that you restrict your questions to the scope of the notice and the subpoena. And if Mr. Tripoli does not object on behalf of RCA, I do object on behalf of the plaintiffs. minutes.

sir?

MR. GOLDENBERG: I understand, sir, and I understand your objection. The fact of the matter is that both of us have been surprised that Mr. Lechner's testimony in the past few

MR. ANDERSON: You mean you and Mr.

Threedy?

MR. GOLDENBERG: Were you aware of this,

MR. ANDERSON: I certainly don't think you should speak on my behalf and say that I'm surprised.

MR. GOLDENBERG: Were you aware of this?

MR. ANDERSON: I take it, you are talking about the Williams' type tube. I think it's old hat, nothing new at all. It's totally redundant of this record and what everybody knows.

MR. GOLDENBERG: You will have a chance to ask the witness.

MR. ANDERSON: Don't say I was surprised.

MR. GOLDENBERG: Were you surprised?
You can tell me that, can't you?

MR. ANDERSON: Surprised by what?

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MR. GOLDENBERG: Mr. Lechner's testimony this morning.

MR. ANDERSON: I can't say I was surprised. It doesn't surprise me at all.

MR. GOLDENBERG: Was this something that you knew of before we came here?

MR. ANDERSON: What?

MR. GOLDENBERG: This activity that --

MR. ANDERSON: Storage tubes.

MR. GOLDENBERG: I'm talking about Mr. Lechner's testimony.

MR. ANDERSON: My involvement in computers goes way back. It's in the record of the MIT storage tubes, old hat.

MR. GOLDENBERG: I understand that, sir.

MR. ANDERSON: It has very little to do with the issues in this case.

MR. GOLDENBERG: I'm talking about this maze game. Were you familiar with this before we came here this morning?

MR. ANDERSON: I don't think that makes a bit of difference. It's outside the scope of what you asked permission to do. This is not a fishing expedition. I don't doubt that RCA made a million other in abortive efforts to

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find a way to do this type of thing, all failures. I don't see how that bears on the record, and I don't think you should be entitled to fish and mislead and try to find one that you like better than the ones you found already. I want to get out of here today.

We are in our second day, one working day before the trial begins, and you're trying to fish for a prior art in a lawsuit that was filed in 1974, and I don't think it is proper.

MR. THREEDY: We are here by a notification of you by some activity of RCA, that activity which you purported to us concerned a pool game.

Mr. Goldenberg's question was, did you also know of the maze game at RCA.

MR. ANDERSON: We had provided you with information one day after we learned of it. We provided you with the means by which you could investigate. We provided you with everything we knew, and you came here last Friday and there was never a suggestion. You met with Mr. Lechner last week, you met with Mr. Tripoli last week, and you met with

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Mr. Teger last week. There's no excuse why you should start the fishing expedition. You had an opportunity --

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MR. THREEDY: We are not fishing.

The witness has answered the questions which have been raised, and some are very interesting issues here.

MR. ANDERSON: I don't want to delay by arguing, and I will stop.

But I protest the proceeding. I won't make any further comments on the record.

MR. TRIPOLI: Gentlemen, the position of RCA in this matter we hope has been one of complete neutrality. In an effort to move these proceedings, I would suggest that Mr. Lechner has already testified at some length about a maze game, and perhaps we ought to at this point move on.

MR. GOLDENBERG: Mr. Tripoli, I understand that. I do have a few more questions
which I will get to as quickly as I can in order
to wind up this maze game.

There are a few more questions I do have with respect to it. I trust you understand why we believe it to be relevant to the issues we have

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in our case in Chicago.

MR. TRIPOLI: I do not know what the issues are in the case in Chicago, so I am not in a position to comment.

MR. GOLDENBERG: If you care, I should attempt to give you our position with respect to them as quickly, as briefly as I can.

Alternatively, I would try to put the remaining few questions with respect to this maze game to Mr. Lechner and wind the matter up.

MR. ANDERSON: I think the latter is the appropriate procedure. We have had 80 days or more of testimony in this case, and maze games are in this record, if you're familiar with it, and I don't know that you are. I don't think you have bothered to order the transcripts or look at the transcripts prior to this in this case, and this is redundant to what is already on the record in this case.

ad (MR. GOLDENBERG: I will not respond. Do not take my silence as acquiescence.

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Lechner - direct

exx.

BY MR. GOLDENBERG:

Q What apparatus was used in conjunction with the cathode ray tube display in order to play the maze game?

A There were basically four components of the entire system. The display unit itself was a Tektronix storage oscilloscope. This was a standard commercial product available from Tektronix. I don't remember the exact type number. There was special electronics designed and constructed by the investigators Miller and Wine to interpret digital signals and supply the appropriate commands to the appropriate signals to the XY and Z inputs of the Tektronix storage oscilloscope.

There was what is called a modem, a data interface to a telephone line; and there was a keyboard, typically a standard typewriter keyboard, but also button boxes; and there may have been a joy stick—in fact, I believe there was a joy stick; and, of course, the time—shared computer at the other end of the phone line.

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sir?

Q What were the button boxes used for,

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What happened was when you pushed a button, that was an equivalent action to pushing one of the keys on a keyboard, but rather than have a user have to deal with the full keyboard when only a limited number of commands were required for the particular task he was exercising, one could use the button box instead which had a few keys rather than the full keyboard.

And was this when the player wanted to move his position on the screen; is that when he would use the button box?

A I believe that in conjunction with the maze game we did provide the button box, but one could also play the maze game by simply using the keyboard and pushing appropriate keys on that keyboard which were designated for the up, down, right and left functions, for example.

A It also emulated the keyboard in that it provided a signal equivalent to a keyboard signal, but it was used to give the user a more direct way of choosing a motion on the screen. Basically, the

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screen of the storage tube were to move in one of eight directions; these were the major compass point directions, up, down, right and left; and then the

way in which graphical entities were created on the

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45 degree direction in between those. And if one

moved the joy stick inone of those eight directions,

a command would be sent saying draw an incremental

line segment in that direction which would then be

drawn on the storage tube.

If the joy stick were held in that position, the command would be repeated until the joy stick was released. So one could draw a line of arbitrary length in any one of those eight directions depending onhow long he held the joy stick in that position. You could do the same thing, of course, by hitting keys on the keyboard to give the same command.

Was the joy stick ever used to play the Q maze game?

I object to the testimony MR. ANDERSON: "play the maze game" by you, Mr. Goldenberg.

- Was the joy stick ever used in conjunction with the maze game?
- It may have been, but I I am not certain. cannot recollect specifically whether it was or not.
 - Do you recall in what year the maze game

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It was certainly played during 1967. It may have been played during 1966, but my recollection is not that certain.

Was the maze game played at any time outside of the premises of the RCA Laboratories at Princeton, New Jersey on this particular apparatus that you have described?

Probably, but I cannot recollect a specific A instance at the moment.

Was the maze game ever played on the premises of RCA with people other than employees of RCA in attendance?

Oh, yes, on a number of occasions, specifically, of course, during the open house in 1967.

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You made reference to an open house in 1967. Could you tell me what open house you are referring to, sir?

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This was a 25th anniversary celebration that was held at the David Sarnoff Research Center at the end of September, beginning of October, 1967 when on two days, if I recall correctly, Thursday and Friday, a variety of visitors both from within RCA and outside of RCA came to the laboratories and witnessed a large variety of demonstrations, and then on Saturday and Sunday members of the general public were there and witnessed these demonstrations and exhibits.

I show you a document which has been marked as RCA Exhibit 1 and I ask you if you have ever seen that before, sir?

Yes, I have.

Could you state the circumstances under Q which you first saw it?

I saw it at the time of the open house. am not certain whether I saw it, you know, first on Friday or Saturday or early that week. But sometime prior to, or certainly during the open house, the dates that are specified here.

Do you have any knowledge as to Q

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Yes.

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Lechner - direct what organization or institution prepared the original of Exhibit 1?

Harry Cooke at that time.

I would presume that it was prepared by the technical relations activity, I believe that is the correct name, that is headed or was headed by

MR. TRIPOLI: Mr. Lechner, you are only required to answer as to your personal knowledge, if it requires you to speculate or take a guess, just say it would, and we will proceed.

Was it prepared by RCA, some part of RCA, to your knowledge?

Well, people at RCA Laboratories certainly participated in the preparation of it.

Do you know why it was prepared? It was prepared --

MR. ANDERSON: I object, lack of any foundation of this witness's knowledge of management's decisions to prepare this document. If he was involved in that, that decision to prepare it, you ought to establish a foundation for his testifying as to why this was prepared.

Q Sir, if you don't know why it was

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prepared, of course, you will tell me. But if you do know, could you answer the question?

THE WITNESS: Can I have Mr. Anderson's comments read back?

MR. ANDERSON: Certainly, but I will say to Mr. Tripoli; Mr. Tripoli, I think there is some confusion here. I think the witness is tending to generalize and speculate, and our purpose is to find facts which he was personally involved in. And we have had a very long silence and the witness has now asked to have my statement read back.

The purpose of this witness being here is to have him tell us what he personally did, not what he is sure went on somewhere else, even though he is very sure.

MR. GOLDENBERG: The purpose of having Mr. Lechner here is to get his testimony as to what he did and his knowledge, and that's all I am seeking, sir.

And Mr. Anderson's comments are not comments directed to you, Mr. Lechner, they are directed to me and if Mr. Tripoli feels that a question that I put or Mr. Anderson puts is inappropriate and should not be answered,

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he will so instruct you.

MR. ANDERSON: I think we all agreed,
Mr. Goldenberg, that this witness is only to
testify as to what he personally did and of
what he has personal knowledge of, not hearsay,
not something which someone else told him.

MR. GOLDENBERG: I don't think I said anything else.

MR. ANDERSON: I wasn't sure.

MR. TRIPOLI: May we have a five minute recess?

MR. ANDERSON: Sure.

MR. THREEDY: Sure.

(At which time a short recess was taken.)

Q I believe the question you had in front of you, Mr. Lechner, was essentially, do you know the purpose of preparing RCA Deposition Exhibit 1?

 $$\operatorname{MR}$.$ ANDERSON: I think the question is why it was prepared.

A I can only speculate as to the specific management reasons for its preparation. It was handed out to people who came to the open house.

I am fairly certain that I received a copy as I came in the door that day. My wife certainly did

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Lechner - direct
     when she came to the open house.
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Q On what page is that paragraph, sir?

A The pages aren't numbered here.

We have the original document.

Q oh, yes, sir.

As you look at the exhibit, that refers to Location 35, on Page 2; is that correct?

A It's on the second sheet of the exhibit, yes.

Q I think you have already answered this question in part, but do you know what was done with the original—or the originals of Exhibit 1 at the time of the open house?

A What do you mean by original?

Q What you see there is a copy, sir. The original document did not look quite like that.

MR. ANDERSON: You mean the master that was used to prepare the ones that were handed out?

He has testified they were handed out.

I will stipulate they were handed out.

It's in the record in Mr. Cooke's testimony.

MR. GOLDENBERG: Thank you, sir.

That's all you had to do.

MR. ANDERSON: Why don't you ask me.

MR. GOLDENBERG: Why don't you suggest what you might be willing to do instead of

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prefacing it with that kind of speech. BY MR. GOLDENBERG:

Do you have any idea of how many people attended the open house?

I don't know a specific number. It was certainly in the thousands.

How were people invited to the open house?

To my knowledge, a variety of ways were used to invite people to the open house. Some were specifically invited by personal invitation of RCA; others were invited through a ticket distribution means. All employees were given a certain number of tickets which they could use to give to their friends, neighbors, family, et cetera, to come to the open house.

Also, local organizations were issued specific invitations to have their members or friends or--I am not familiar with the exact details, but to have additional people come to the open house.

Now, I believe you testified that the Q maze game that you described earlier was a demonstration at the open house. Could you by reference to Exhibit 1 state where that game is described in any fashion?

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A Yes. It's described on the second sheet of Exhibit 1, in the right-hand column, location 28, "Graphical Display."

Q Could you by reference to Exhibit 1 indicate where we might find Location 28?

A Yes. Location 28 is on the first floor, near the bottom center of the diagram. Actually, I believe that's Room West 124 at the laboratories.

Q Was that the room in which the equipment used to play the maze game was ordinarily located?

A Yes.

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Q Do you know whether ornot any of the visitors to the open house visited Location 28?

A Yes, many did.

Q Were any of the visitors permitted to play the maze game, do you know?

A Yes, many were.

Q Was there anyone there at Location 28 for any purpose, any employee of RCA, in conjunction with the demonstration?

A Yes. As was the case with all of the demonstrations during the open house, there were RCA employees in attendance. And in general, they were the people associated with the particular project and took appropriate turns.

Messrs. Miller and Wine, for example, were in attendance at Location 28 at various times during the open house.

In the description of Location 28, I see a reference to a remote computer. Where was the remote computer?

A The remote computer was in downtown Princeton.

It was a computer owned by the Applied Logic

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Corporation, who was in the business of providing lease time-shared services.

Do you recall the manufacturer and model number of that computer?

It was a Digital Equipment Corporation computer, and I believe it was a model PDP-6 at that point in time. They subsequently had model PDP-10 s. But I'm fairly certain that the one used at that time was a PDP-6.

Were you yourself personally at Location Q 28 at any time during the open house?

Yes, I was there from time to time during the open house.

At any time while you were there, did any of the RCA people in attendance provide an explanation to the visitors of what they were seeing? Yes.

Do you recall generally the content of Q that explanation, or to any degree the content of the explanation, if you heard it, sir?

The explanation was done in conjunction Yes. with the demonstration on the display. The computer had been programmed to start with an alpha numeric message on the display, which explained in English text what the display was capable of doing and how it

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was connected to a computer and something about the general hardware that was involved there. And what generally was done, when a group of people assembled in the room the person in attendance would ask for their attention and give a command to the computer to start that text message. And then after that message was completed, he would explain what would be shown next, which might be a mathematical graph or a curve, and he would enter some command and the display would proceed to plot that graph or curve, and he would go through two or three examples of things the display and the computer system could do. And then he would finally end with the maze And after demonstrating how one played it, he would invite people from the audience in attendance to have a turn at playing it. It was a very popular exhibit, and generally people were waiting in the hall to get in, and he would have to stop people from playing after a certain point so that the next group could have a turn. And other people during that time period would be asking questions informally about what the system did and how it worked, and the people in attendance would explain that.

Q At any time you were in attendance,

did any of the visitors ask questions?

- A Oh, yes.
 - Q Were those questions answered?
- A Yes.

- Q Do you have any recollection as to whether any of those questions went into technical aspects of what was being shown?
- A Some of them did, yes.
- Q Was that kind of question answered, sir?

 A Within the bounds of not transgressing

 proprietary information, the questions were answered,

 yes.
- Q Was there any other equipment or apparatus of any kind in location 28, other than the equipment necessary to play the maze game?
- is an ordinary laboratory bay where, under normal times, members of our technical staff would be working. There were, undoubtedly, oscilloscopes and volt meters and power supplies and test leads, and things of that sort, in the room during the time of the demonstration.
- Q Could you tell me whether or not RCA has developed any products which grew out of this activity for which you were responsible in 1967--

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Lechner - direct
that is, the activity involving displays on the
face of cathode ray tubes?

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MR. TRIPOLI: I think it would be appropriate for you to restrict that question to a period of time and not forever.

MR. GOLDENBERG: All right, sir. Let me restrict it then to the filing date of the first application of the patented suit, which is in--let me be precise--May 27, 1969. Is that all right, sir?

MR. TRIPOLI: Yes.

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will.

With that limitation.

Up to May 27th, 1969?

Right.

I need a clarification of the meaning you mean A to place on the word "product".

Well, by that I mean any piece of equipment RCA would have brought to the point of development where it was offering it for sale to the public.

And the context of the work that I supervised during that time is all encompassing, of all the things of my group?

No, sir. I have particular reference to this activity involving the display on the cathode ray storage tube.

MR. ANDERSON: On the Tektronix storage tube.

Well, I want to leave it open, sir, that 0 he may have been in connection with that activity been using equipment in addition to that, but certainly limited to display of data or symbols on cathode ray tubes.

MR. ANDERSON: Well, on storage tubes.

MR. GOLDENBERG: Storage tubes, if you

THE WITNESS: No, we did not bring a product to the point of offering it for sale to the general public in that time period.

Q Prior to May of 1969?

- A That's correct.
- Q Could you tell me whether or not development effort on that project, and again this is the project of display, cathode ray storage tubes, was that activity abandoned on the part of RCA insofar as you know and the products -- the development with which you were concerned?

MR. ANDERSON: Namely, storage tubes.

THE WITNESS: In the sense of bringing it to a product that would be offered for sale to the general public, there was a point in time at which the project was terminated in that sense.

We have continued --

MR. TRIPOLI: I think you answered the question.

MR. GOLDENBERG: Mr. Tripoli, I do have a problem here, and I put it to you and I recognize RCA's concerns in the matter. Let me phrase a question that I would like to put, hopefully my final question on this

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matter, and see if you would not permit the witness to answer it.

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Has RCA abandoned all interest in the use of cathode ray storage tubes as devices on which various symbols may be displayed and manipulated?

MR. TRIPOLI: I would have to object to that question.

MR. ANDERSON: I object to that question--

MR. TRIPOLI: Because this witness is not in a position to speak for RCA. It is a large corporation with a lot of activities.

MR. GOLDENBERG: Let me add, to the extent of his knowledge.

MR. TRIPOLI: I think we ought to still restrict those questions to at least the time period that you previously suggested, namely May of 1969.

MR. GOLDENBERG: All right, sir, I accept that. I will have to live with that problem.

MR. ANDERSON: Then you are not going to ask that question?

MR. GOLDENBERG: No. I withdraw the

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question.

Mr. Lechner, do you have any familiarity with a pool game played on a cathode ray tube at the time of the open house?

Yes, I do.

How did you gain what familiarity you have with respect to that matter?

I was a member of the open house planning committee during that time period and in the course of discussions of what things were to be shown at the open house that were conducted by the committee, the pool game, of course, was one of the displays that -- or exhibits that were considered and put on the list of things to be included as a part of the open house.

MR. ANDERSON: Before you ask the next question, I think I should clarify the record on the preceding question.

I started to object and Mr. Tripoli made a statement. I have no objection to your asking that question that you posed, provided it wasn't the last question, as you said, because if the witness answered in the negative, I would have permitted it to be the last question.

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If he had answered it in the affirmative, I certainly would have wanted him to pursue it at length, and that was the only reason for my objection to your last question.

MR. GOLDENBERG: I was only speaking for myself.

MR. ANDERSON: Well, you were making some sort of commitment to Mr. Tripoli when you spoke.

MR. GOLDENBERG: Whatever commitment I made to Mr. Tripoli was my commitment. You make your own or don't make them as you see fit.

Do you recall who suggested the game of pool as part of the open house demonstration? The suggestion was probably brought to my attention by Mort Lewin.

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Do you know who had responsibility for doing the work necessary to prepare the pool game

demonstration for the open house? The supervisor responsible was Morton Lewin. The people who specifically worked on it were

members of his research group and they were specifically Mr. Teger, Mr. French and Mr. Larkin.

Do you know when they began to work on thatproject?

Sometime in the spring or early summer of 1967.

Was the project completed in time for the demonstration, the open house?

Yes. A

Was it a part of the demonstration at the open house?

Yes.

Did you yourself observe that particular 0 pool game demonstration?

Yes, I did.

At the open house?

A Yes.

Were other people there at the time you were observing it?

Yes.

Were any of the visitors, that is people Q

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Lechner -direct other than RCA employees there at any time that you observed it?

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Yes, there were. A

- Did you observe it more than once, sir? Are you confining your question to the period of the open house?
 - Presently at the time of the open house.
- That four-day period? A
 - That four-day period, sir.
- I am not certain whether I saw it more than A once during that four-day period, but I probably did.
- Was there anyone, was there an RCA employee there during the open house providing an explanation such as you described in connection with the one at Location 28?
- Yes, there were, as I said earlier in all of the exhibits there were RCA employees present to A describe what was being shown and to answer questions.
- Q Did you hear any explanation provided in connection with the pool game demonstration?
- During the time of the open house? A
 - During the time of the open house, sir. Q
- I am not certain. I may not have been in the room at a point in time when the explanation was

being given. I can't be certain.

Lechner -direct

O Did you at any time receive an explanation of how the pool game demonstration operated?

A Yes.

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- Q From whom did you receive that explanation?

 A It would have been either or both, or all,

 Mr. Teger, Mr. French and Dr. Lewin.
- Q In providing you with that explanation did they also explain to you or describe to you the apparatus involved?
- A They probably did not describe the apparatus specifically at the time they gave that explanation tome because I already had a general familiarity with the apparatus and it would not have been necessary for them to repeat that specific aspect of it.
- Do you have any recollection at the time they provided whatever explanation or description they gave you that you had an understanding of how that apparatus and demonstration worked?
- A Oh, I certainly had an understanding of how the apparatus and demonstration worked, yes.
- O Did you come to any view, I am talking now on or about the time of the demonstration, as to whether or not the objectives that Dr. Lewin

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and his people had were achieved with respect to the pool game demonstration?

MR. ANDERSON: I object to the question. It lacks a foundation, it is irrelevant and it is speculative. There is no foundation that this witness had knowledge of all of the objectives of Mr. Lewin and, certainly, therefore, cannot say whether those unknown objectives of Mr. Lewin were accomplished or not.

I suggest you call Mr. Lewin if you want that information.

Do you know what the objectives were Q in preparing the pool game demonstration?

MR. ANDERSON: I object for lack of a foundation. Whose objectives?

MR. GOLDENBERG: Well, the witness has testified he was on the committee responsible in part for arranging demonstrations, and I don't know that there is anyone better we could call to inquire as to what the objective of any particular parts of the demonstration was.

MR. ANDERSON: I think you have asked that question of another witness and it's

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been answered.

MR. GOLDENBERG: Well, I am asking it of this witness. I understand that, sir.

MR. ANDERSON: I object also on the ground that it is not the best evidence unless you establish that this witness had full knowledge or it was his objective that you are inquiring about.

MR. GOLDENBERG: Well, I have already stated my position. I truly do not understand the best evidence objection, which I don't believe has anything to do with what we are concerned with, sir.

If you have not forgotten my question, Mr. Lechner, could you answer it?

THE WITNESS: The objective was to, with respect to the open house, find a way to demonstrate interactive computer graphics in a way that would have meaning to the layman.

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Based on your knowledge of the pool game, as you saw it and it was explained to you, did you form any view at the open house or prior to the open house as to whether that objective had been achieved?

Yes, I think the fact that the exhibit was a very popular one and was commented on frequently by people who had attended the open house, made me feel that the objective of creating something that had popular appeal to the laymen had been achieved.

Do you know whether or not people were able to play a game on that apparatus approximating or resembling a real game of pool?

They were able to play the game --

MR. ANDERSON: I object, you are leading the witness, clearly.

MR. GOLDENBERG: I don't think so. don't think so.

Could you answer the question, sir?

THE WITNESS: They were able to play a game that simulated a game of pool in the sense that using the light pen was equivalent to using the cue stick and that seeing the balls move on the screen was equivalent to seeing

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them move on a real table. And in that sense they were able to play a game of pool. details of scoring and so forth were different from the usual scoring arrangement in the pool games as I know them. I am not familiar with all the ways in which pool can be played, but the scoring was not quite the usual scoring. But it simulated the playing of a game of pool.

Could you state your understanding of the apparatus you used to demonstrate the pool game and how it worked?

Well, the apparatus consisted of several components.

There was a computer which was an RCA model 70/25 with the usual kinds of computer peripherals, card and tape equipment and high speed communication interface to a larger computer.

There was also a special direct memory access interface. That is a piece of hardware that was designed and constructed by Dr. Lewin to interface the computer to the display unit.

The display unit was a commercial item manufactured by Information Displays, Incorporated, IDI, which was purchased from them. It consisted

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Lechner - direct

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of the cathode ray tube itself and the necessary digital and analog hardware to interpret commands from the computer and generate deflection and intensity modulating wave forms for the cathode ray forms to produce the image on the screen. There is also a light pen associated with the display and, of course, there was a keyboard to allow communication to the computer.

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Thank you, sir.

I would like to return to the maze game

for one further question. As I understood your

description of the maze game that as the player moved

across the face of the tube, if he bumped into a

wall he would be stopped; is that correct?

Thatis correct. There were several different

ways in which the game proceeded from that point

which were either selectable options when one started

the game or they were changes that the people

programming the game made from time to time during

its evolution. The most usual next step, as I

recall it, was that he would be put back to the

beginning. The wall that he hit would be momentarily

drawn in to show him that he had hit a wall, and

then he would be put back to the beginning.

so it behooved him to remember the steps he had

taken thus far without having hit any walls before

he could continue and remember that in one of the

four directions he would try to go at that point--

actually, one of three directions, because the

fourth direction would be retracing one's steps,

he would hit a wall. So his options had been reduced

from three to two, if he could remember all the

That was the challenge mentally to get

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Lechner - direct through the maze.

QCould you describe what the observer would see upon the circumstance of hitting a wall and being put back to the beginning? What would he see taking place on the face of the tube?

What he would see taking place is just prior to having taken that step there would be the rectangle that outlined the maze, there would be the corner markings, the beginning point and end point, which I believe or maybe a small X and a small zero, or maybe they were both small x's. He would see the path he had followed thus far traced out, go up one step or up two steps, and so on, to whatever point he was at. He would then see the short line segment that he had attempted to draw in the direction he had chosen to go. When he pushed the key to make that choice, that segment would be drawn. Then the piece of wall that he had hit would be drawn. There would be a momentary pause, and then a green flash on the screen which was due to the erasing of the screen, because the computer at that point issued an erase command to the display. That completely erased the screen. And then the outline would be redrawn, and the starting and end points would be redrawn, and

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Lechner - direct
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Lechner - direct

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Q Could you describe briefly the apparatus or mechanism or method by which the game detected when a player had hit a wall?

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The maze itself was stored in the memory of the computer, being in the form of a mathematical description. And so the computer knew, if you will, where all of the walls were for the particular maze that was challenging the player at that point. And so the computer also, of course, kept track of the steps he had taken thus far. And when he took that next step, the computer checked against its prior list of the knowledge of the physical description of the maze to see whether he had chosen a direction that would take him into a wall. And if so, he took the action that I previously described. If not, he drew the line segment that he had chosen previously and then he would continue from there.

Q In what you have just described, was it a determination that the player had actually hit the wall, or was it a determination that he was moving in a direction where he would hit a wall?

A It was a determination that he was moving in a direction where he would hit a wall.

MR. GOLDENBERG: I think we are just about

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May we just have a minute?

MR. TRIPOLI: Sure.

(A short recess was taken.)

MR. GOLDENBERG: Very few more questions,

I trust.

BY MR. GOLDENBERG:

Mr. Lechner, did you receive tickets for the open house?

Yes, I did. A

What did you do with your tickets, sir? I distributed them to some members of my A immediate family, my wife, my parents, and also to some friends and neighbors.

How many tickets did you receive?

I don't recall the exact number.

Were there any restrictions put on you as 0 to whom you could distribute tickets?

Not that I recall, no.

Were any of your friends and neighbors Q employed by any other companies, that you know?

Yes. A

Were any of them employed by any other Q companies engaged in any aspect of the electronics business, if you know, sir?

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I just have to think.

I understand.

I don't believe any of the people to whom I gave tickets were employed by companies in the electronics business.

Do you have any knowledge of any motion Q picture, or motion pictures made of the pool game demonstrated at the open house?

Yes. A

Could you state what that knowledge is? Q There was a motion picture made by the BBC at some time after the open house; I don't know the exact time.

I'm also reasonably certain that CBS News made a film of the pool game prior to the open house. It would have been earlier that week.

Earl Ubell, their reporter, and a film crew came to the laboratories sometime earlier that week and filmed a number of exhibits. In particular, they filmed the solid state display, shown at Location 35, and I was present personally at that filming; and a portion of that film was shown on CBS news. They filmed a number of other things, and I'm fairly certain that the pool game was

included; but I was not present, I don't believe, when they filmed it.

Their records, of course, would show what they filmed and whether they have the film, and, so on.

- Q Have you ever seen the BBC film?
 Yes, I have.
- Q When did you first see that, sir?

 A I don't know the specific date. It was some years ago.
- Q Do you think it was before 1970?

 A I'm quite certain it would have been before 1970, yes.

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Q Do you recall the occasion on which you first saw it? What were the circumstances?

A I don't have a specific recollection of circumstances.

Q When was the most recent occasion which you saw the film?

A Last Friday.

Q Could you describe the circumstances under which you saw it then?

Fred Teger and Harry Cooke and I, and Mr. Roy
Christensen, who ran the projector--Russ and John
left--and perhaps one or two other people were
present in the room, East 101, at RCA Laboratories
shortly after lunchtime, when the film was run.

On any occasion that you have seen it, be it the first time or the occasion on last Friday, and your recollection of the pool game demonstration at the open house in 1967, do you believe the film to be an accurate depiction of the pool game demonstration as it was at the time of the open house?

A Yes, sir.

MR. ANDERSON: I object to the question as irrelevant, hearsay, asking for opinions,

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MR. GOLDENBERG: The best evidence, of course, is the film itself. But due to a

set of circumstances beyond any of our control, it is not here today. So I think I'm entitled

to inquire into the witness's knowledge according to his best recollection.

MR. ANDERSON: Well, you and I may disagree whether the film is the best evidence; but at least we agree that this testimony is not.

BY MR. GOLDENBERG:

I believe you answered the question; Q did you not, sir?

Yes.

In the pool game, as you recall it Q being played in the fall of 1967, what would happen when the cue ball hit one of the other pool balls? The cue ball would rebound and the other ball A would be set in motion on the screen.

What would happen when any one of the Q balls hit the side of the pool table? It would rebound from the side of the pool table.

Were there pockets in the display of Q

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Yes. There were the normal six pockets: the four corners and the centers of the two long sides.

What would happen when any one of the balls would enter a pocket?

It would disappear from the screen.

Do you have any knowledge of any newspaper reports with respect to the open house in the fall of 1967?

> MR. ANDERSON: You're referring to present knowledge today?

MR. GOLDENBERG: Present knowledge today. I thank you, Mr. Anderson.

MR. ANDERSON: Of something that

exists today that purports to be something --£./* BY MR. GOLDENBERG:

Do you understand my question, sir? o . rease It's possible you don't after Mr.Anderson has 1.00 contributed.

Could I have it read back?

MR. GOLDENBERG: Yes.

[The Reporter reads the pending question.]

MR. ANDERSON: I object to the question as hearsay, irrelevant. Mr. Tripoli has produced some documents. If you're asking

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had in 1967, that's a different question.

this witness whether he has seen documents produced by Mr. Tripoli, that's one thing.

If you're asking him about knowledge that he

I'm not sure which one you're asking. Until

I do, I object on the ground that it's vague and ambiguous.

MR. GOLDENBERG: I don't believe it is, sir.

BY MR. GOLDENBERG:

Do you find the question vague? Q If you do, tell me where you are troubled by it and I will attempt to explain it.

I will attempt to answer the question.

All right, sir. Thank you.

I know that members of the press were in attendance at various times prior to and during the open house. I specifically remember the CBS news people being there, as I testified earlier. presume that they had written some reports which were probably published, but I have no specific recollection of reading any of those reports at that time.

Do you have any recollection of reading Q any such reports at any subsequent time?

MR. ANDERSON: I object to the question

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DE 312 6-0338 CROSS-EXAMINATION BY MR. ANDERSON:

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Mr. Lechner, you have made certain Q references to Location 35. It's one of the locations listed on the second page of RCA Exhibit 1.

Was Location 35 a demonstration of that 1200 element fail-electric display that you testified that you worked on earlier in your testimony?

Yes, it was.

That was the one that was a 30 x 40 element matrix, where each element could be illuminated to generate a display of some sort? That's correct.

I notice that that location 35 display is under the category in Exhibit 1, "Audio and television." Was that a part of television work that was being done at the laboratory at that time? Yes and no. Let me try to clarify that.

The work was done under my direction in a group that was a part of our computer research activity. But the display itself had the capability of reproducing a rudimentary television image limited to 1200 elements of resolution. And so it had

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relationship to television.

larger number of elements, it could have been used equivalently to a cathode ray tube in reproducing television images. And so one could classify it as computer-related or television-related, or both, since digital techniques were used in controlling and addressing it. But in the end, it produced a television-like image.

Q Right, I understand.

both on the computer research and the development and on television research and development?

A The group was chartered to work on computer related projects. However, one frequently has difficulty in making a clear distinction between different fields when classifying a particular project and its objectives.

This display clearly could be applied to television application or to computer terminal and peripheral applications. And we certainly, those of us who were directly in that work and participated in it, had both potential and applications in mind.

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Lechner - cross 1200 element display, I think you testified that your work took digital data and converted it into X, Y and Z data to activate the display; is that correct?

Not exactly. The display is digital in nature because it has discreet elements, as opposed to the analog nature of the cathode ray beam, which is scanned by a signal that is analog in nature in general. However, the information source that we used, namely a television camera, was analog in nature.

The signals that were taken from the camera were processed and delivered to the display in a fashion that was both analog and digital.

The positional aspects of the information were digitized and addressed specifically to 30 and 40 elements of the rows and columns respectively.

But the brightness information was transferred in analog fashion.

Now, to relate what you have just said to Q your prior testimony, which I think was X, Y and Z, then if I understand it, the processing in the digital equipment that you created produced an X address between one and 40, I presume, and a Y address between one and 30 to locate the particular

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spot that you wanted to illuminate; and then it generated Z information, which was intensity to tell the equipment how bright that specific point should Is that essentially correct?

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That's correct, except that the Z information was not separately transmitted to the panel. The brightness information was contained in the amplitude of the Y -- I'm sorry -- the X pulse that was delivered to the column of the display. So that only two signals actually were used to address that point, the X and the Y signals; the brightness information being contained in the X signal.

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I understand. Now, on the electronics storage tube, when you displayed your maze demonstration, it is my understanding that there was acontinuous line generated that showed the path that the operator selected along or across the screen, is that correct?

Not exactly. The line was not really a continuous line. The line was made up of a series of individual dots. The overall screen was divided into a rectangular, actually square array of 512 by 512 positions. And the electronic hardware that drove the Tektronix scope could either put a dot down or not put a dot down at any particular position the beam was at. Or it could move the beam in any one of eight directions to the nearest -to the nearest dot, nearest next position and then put a dot there or not.

And did the operator build this series Q of dots that looks like a line one dot at a time of a group of dots at a time?

The command structure that came from the computer told the hardware to make a line of either one dot lengths, two dot lengths, four dot lengths, et cetera, binary progression.

So the next one would be eight and Q

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sixteen?

Eight and sixteen and so on. In one of those eight major compass point directions. The hardware would then interpret that command to step the beam through the appropriate number of steps, one, two, four, eight, et cetera, and one of the eight directions and illuminate each dot at each step. So that the appearance to the observer was the creation of a line segment, but it actually was comprised of a sequence of dots.

Q Did the operator who was generating the demonstration decide whether a given step would be made up of one dot, two dots or 16 dots, or was that preset?

A In the case of the maze game, the programmer who wrote the computer program decided in advance how many separate positions there would be in the maze and what the length of the line segment would be, and when the player of the game pushed the key saying he wanted to move to the right, for example, the program would generate the command to the hardware to generate a line segment of a certain length in that direction to the right, and the hardware would interpret that producing that line segment as a sequence of dots in that direction.

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numbe	er of	dots	were	applied	each	time	the 1	button	was
press	sed?								

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A I don't remember the specific number.

- Q Was it more than one?
- A It was more than one.
- Q So each time the button was pressed at the demonstration it appeared that a line segment was immediately generated on the screen?
- A That's correct.
- Q And as that was being done in the demonstration, as I understand it, there were no walls or barriers visible on the screen, but they were all invisible and the operator didn'tknow whether he was going to hit one or not when he made a selection, is that correct?
- A In the usual mode that is correct. There were different modes in which the game could be operated! and at various times during the open house the different modes were used.

I described earlier in some detail the usual procedure where no walls were visible, and if one moved in a direction that would make him hit a wall, the wall was momentarily drawn and then he

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was put back to the beginning.

Another mode in which the game was played was the following:

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When he would hit such a wall, the wall would remain and he would not be put back to the beginning but he would lose a point and he could continue from that point on. So a partial maze would be constructed for him every time he hit a wall; that wall would be drawn and left there. So there were several modes in which it could be operated.

AIn the usual mode at the time of the 0 selection of the line segment that would have intersected the wall, did you see a cross where the line of the operator intersected the line of the 14 wall and then get this green flash that you referred to when the screen was erased and you got a start over? I don't specifically recall what was drawn 17 ||A 18 on the screen when the operator made such a choice 19 that would take him into a wall. I know, my recollection 20 is certain that the wall was drawn momentarily and then 21 the erase splash occurred. But exactly how the fact that he had hit the wall with the line segment was 23 shown to him, I do not recall today.

Oscilloscope that you were using in this work, as I understand it, it was an oscilloscope that had the ability to display a point or a line and that would continue to appear without refreshing for a long period of time, is that correct?

- A For a period of time, that is correct.
 - Q What was that?
- A Not indefinitely.
- Q What was that period of time, do you know?
- A Minutes, certainly. There would be a gradual deterioration of the quality of the image with time. And one has to decide when he considers it no longer acceptable. But it is minutes.
- Q But once the point was put on the visible screen, it would stay there for a period of minutes?
- A That is correct.
- Q So as you displayed this line in that demonstration, unless you erased the whole thing with this green flash, you continued to see everything that had been put into it by the operator for the last several minutes?
- A The usual mode was to operate precisely

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as you describe; that is to, unless you erase the entire screen, you would see everything that had been drawn since the last full screen erasure.

However, it was possible to operate in a mode where you could display information on the screen but not have it be stored, in which case you would have to refresh it if you wanted to maintain its viewability.

Q Now, I believe you testified that out of this work with the Tektronix storage oscilloscope, up until 1969, no sold product or products offered for sale by RCA was generated, is that right?

A That's correct, there were no products offered for sale.

Now, isn't it a fact that even after 1969 that that same fact is true, no product was offered for sale that grew out of this Tektronix static display work?

MR. TRIPOLI: I will advise the witness that he doesn't have to answer that question.

MR. ANDERSON: I think you permitted him to answer as to 1969, and I think we are entitled to know.

 $$\operatorname{MR.\ THREEDY:}$$ He restricted the question up to 1969.

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MR. ANDERSON: I understood that.

MR. THREEDY: We were not permitted to go beyond 1969, Mr. Anderson. I don't think on cross-examination you have any greater right to go beyond 1969.

MR. TRIPOLI: I specifically restricted the question to the 1969 period because the subpoenaes were framed to 1969.

MR. ANDERSON: Not the subpoena Mr. Goldenberg is acting on, only our subpoena as to documents.

MR. GOLDENBERG: I think Mr. Tripoli restricted it and I think both sides should respect that.

MR. ANDERSON: I will put some other date limit on it, but I would like to go beyond 1969.

MR. Tripoli, can the witness answer the question concerning the period up until, say, 1972? That is certainly not current work.

MR. TRIPOLI: In fairness to both sides and because I don't know the answer to your question, I would restrict the answer to 1969.

MR. ANDERSON: We are only asking, Mr.

Tripoli, about products that have been sold by RCA, on the market.

Now, that certainly is not confidential information. I will ask again the question up through the end of 1962 with respect to RCA products that were offered to the public for sale, and it is restricted to that.

MR. TRIPOLI: You can answer that question if you know the answer to it.

THE WITNESS: And the specific, the question refers specifically to products based on a storage tube display?

MR. ANDERSON: That's correct.

THE WITNESS: Can we have a momentary conference?

(Discussion off the record.)

MR. ANDERSON: Back on the record.

Mr. Goldenberg; while you were out of the room, and Mr. Threedy was here, we had a brief discussion about the pending question and I indicated I was only interested in responding to the last question with respect to storage displays that were offered for sale by RCA prior to the end of 1972 which included some sort of operator interaction because if

Lechner - cross

there is something internal that just used for pure storage, or that type of thing, I am not interested in.

And if it is all right, then I will restrict the question and if Mr. Tripoli will permit the witness to answer, I would like the answer to that question.

MR. GOLDENBERG: If Mr. Tripoli has consented, I will not say anything now. We will see on redirect if I have a problem there.

I don't want to complicate your life anymore than I actually must.

MR. TRIPOLI: I would instruct the witness he can answer if he knows the answer to the question.

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THE WITNESS: Prior to the end of 1972, to the best of my knowledge, RCA did not offer for sale any commercial product to the general public based on the use of a direct view storage tube with operator interaction such as the display system that was shown at the open house during 1967.

Q Thank you.

Now, you testified, I think, that today you have between 20 and 25 technical people reporting to you and approximately the same number of support people, is that correct?

A That's correct.

In 1967, perhaps in the early part of 1967 before your responsibilities changed, how many people reported to you, if any?

A Approximately five or six members of the technical staff and approximately four or five supporting—three to five supporting technical people.

- Q With respect to your duties and responsibilities in the latter half of 1967 after you had a change of duties, did that number change?

 A Yes, it did.
 - Q How manydid you have then?

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It increased to eight or nine, to the best of my recollection, members of the technical staff, and five to seven supporting technical people.

I think you said you were in a section in early 1967 that reported to Dr. Ian Rajchman, is that correct?

A That's correct.

> Q Was that section 10?

Yes, that was what was known as section 10. A.

I see. And later in the year you said you reported to Mr. Webster, is that correct?

Dr. Webster, yes. A

> Dr. Webster. Excuse me. O

And was that section 11 when you reported to Dr. Webster?

Yes.

You used the term several times "inter-Q active graphics," and I think at one point you said what you meant by that. My notes indicate you said interactive graphics equals a system where the operator could manipulate something and see the result on some display. Is that a fair definition? If it is not the one you gave, is it fair? Maybe I should clarify it to be precise so that we the wording is not ambiguous.

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Fine. Excellent.

To me interactive graphics means a situation where a human being makes commands to an electronic system by pushing keys, using light pens, using joy sticks, mouses, et cetera, which indicate to the computer system that he wishes a change to be made in a graphical entity; a description of which is stored within that computer. And the human being receives feedback as to the action the computer has taken by a visual presentation on the screen of a cathode ray tube or other visual display device such as a matrix XY address display.

And this iterative interactive process continues and typical applications are the creation or the modification of engineering drawings applicable to printed circuit boards or masks for integrated circuits or architectural drawings, et cetera.

Mr. Lechner, did you own a television receiver in 1967?

Yes, I did. A

When did you acquire your first Q television receiver?

I acquired my first television receiver -- it is A a question of what is meant by my.

Lechner - cross

Our family acquired its first television receiver in 1947 or '8. It was a transvision kit which I built in high school.

And I understand you continued after that to do television receiver maintenance through about '53, I think, according to your direct testimony?

A Yes, I worked on and off between 1947 or '48 and the time I entered the Army in early 1953 repairing television sets; first while I was still in high school on a part-time basis for friends in the neighborhood and so on, and then subsequently during 1950, '51 and '52 part time at times when I was going to school for friends and neighbors, and full time for two television firms located in New York City.

Q Have you continued to do your television receiver maintenance since that time?

A I still fix my own, yes.

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I think you said that in the Spectra 70/25 that was used to demonstrate the equipment at the open house with a pool demonstration, the Spectra 70/25 was interfaced with a larger computer, is that correct?

That's correct.

Q What was the larger computer?

The larger computer at that time I believe was a Spectra 70/45 or of that family.

Q Now, from testimony yesterday we were told that the Spectra 70/25 had a price from RCA in the neighborhood of \$90,000. Does that conform to your understanding?

I don t remember the specific prices of our computer products at that time, but -- I don't remember what they specifically were.

Now, with respect to the larger computer, the 70/45, what was the approximate price of that computer?

Again, I have no idea of the specific price.

Well, in some meaningful parameter Q can you relate it to the size of the 70/25? Was it twice as big or five times as big?

It was a larger computer and it had a larger complement of peripherals associated with it and,

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therefore, its cost would have been greater than the cost of the 70/25 and its peripherals.

Do you have any idea of whether that would be in the order of twice as much or five times as much or ten times as much.

I would think it would be at least twice as much, but I have no specific knowledge of those prices at that time.

Q Now, was that interface between the 70/25 and the 70/45 used at all in the pool demonstration, if you know?

No, it was not used in the pool demonstration. It was used to permit those two computers to communicate with each other when that was a desirable thing to do for the transfer of programs and for other uses which the 70/25 was intended to fill. It is possible that the pool game program was at one point moved between those computers over that communication link, but I am not certain of that and have no specific knowledge of it.

With respect to the work which you were doing for RCA, both prior to your change of duties in mid 1967 sometime and after your change of duties in mid 1967, were all those activities at the David Sarnoff Center in Princeton or did they take

you elsewhere?

The work that I was doing and the people that reported directly to me was all done at the David Sarnoff Research Center, but we had periodic contacts with people in the divisions of RCA, various divisions of RCA with whom we were cooperating in some fashion or other, either they were able to supply us with knowledge that would be helpful in our work or they were the potential product activities within RCA that would use the results of our research and development in Princeton.

Now, you have testified with respect to 0 work on interactive graphics at RCA in 1967 that (1) you were working on this system using the Tektronix storage display and (2) there was work being done with the IDI equipment.

Was there any other active program going on at the RCA David Sarnoff Center in 1967 with respect to an interactive graphic system that you know of?

Certainly the work we were doing on the faro electric matrix display could have been applied to interactive graphics. We never specifically demonstrated that on that display, but it was always in the back of our minds that that was one of the

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impossible applications of that display. If one considers a hard copy device a display and the broad use of the word display generally does include a hard copy device, we were working on some hard copy devices that were capable of producing line drawings and simple graphic entities and that were interactive on time-shared computers.

Q Any others that you can recall right now?

A No others that I can recall right now.

MR. ANDERSON: No further cross-examination.

REDIRECT EXAMINATION BY MR. GOLDENBERG:

Q Mr. Lechner, I show you a photograph which has been identified as RCA Deposition Exhibit 12 and I ask you, looking at that photograph, can you tell me if all of those things which I will characterize as cabinets in the background of the drawing, there seem to be two rows of them, were part of the 70/25 computer, or were some of them part of some other piece of apparatus as well?

A They were all a part of what we called the 70/25 computer system. But the 70/25 computer itself occupied only a portion of all of those cabinets.

A computer is a system that has many components. It has the main central processing unit, the memory,

associated with peripherals, which should the controllers for the peripheral -- the peripheral equipment including the card punch and the magnetic tapes and so forth. All of those things were housed in these cabinets and some of the cabinets also contained the communications interface which I mentioned earlier that was able to talk to the larger 70/45 computer.

Also, somewhere in one of those cabinets was that special direct memory access interface that enabled the computer and the display to communicate with each other.

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You made reference to a 512 dot matrix in response to a question by Mr. Anderson, sir. Could you describe what this matrix was on the face of the tube, I gather? Is it a series of dots and rows and columns, or locations?

Right. What was done in the case of the A storage tube display system was for the purpose of creating a graphical entity, including alpha numeric characters, which were also treated as graphic entities.

The screen was divided up into a matrix of 512×512 positions, approximately a quarter of a million individual dot positions, which were arranged in 512 columns of 512 elements each, side by side, equal spacing between them. When the computer sent an instruction to the display to draw a graphical entity, if it was commencing to draw something from a blank screen, the display hardware would position the beam at the lower left-hand corner of the screen, and the computer could then send instructions to the display hardware to move the beam a specific number of dots to the right or to the left or up or down, or in a 45 degree direction, the eight major compass points in all from the present position. And the

starting point was always the lower left-hand corner. But once you had made one such movement, you could then make subsequent movements from that last point, and so the display was always built up on the screen in that fashion.

When the beam actually moved, it moved in small incremental steps along that 512 x 512 grid. The beam was either instructed to remain off, that is, to not write on the screen when it made those motions, or to at each of those individual steps when it pauses before taking the next step turn itself on and make a dot at that point.

As I explained earlier, the instructions always called for the beam to move either one position or two positions or four or eight or sixteen, in binary progress, so that one could efficiently make the line segment of any desired length by calling for the appropriate number of steps in sequence.

For example, if one wanted to make a 15 unit long line, one would call for a step of eight, a step of four, a step of two, and a step of one; and that adds up to fifteen.

The individual spots were generally not visible as individual spots, because the resolution capability of the display was approximately equal to

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0 Thank you, sir.

With reference to the maze game, you indicate there were several modes. Was there a mode where the maze was displayed at all times during the playing of the game?

Yes. I believe there was what we would have A called the very simple mode, where the entire maze would appear, and all that the operator had to do, or the game player had to do was not make a mistake in choosing his directions as he worked his way through it. We sometimes initially demonstrated it that way so that people could gain an understanding of what they were trying to do by showing them the whole maze is working your way through and saying now you have to do it without being able to see the walls.

How was that done, if I understand what you have said, that the storage tube had a capability of displaying whatever was written on there, say, for a matterof minutes, and perhaps it might take somewhat longer than that to play a game when you are playing it in I think what you have called this simple mode?

No. Generally, it would take a person a matter of only a couple ofminutes to play the game, and

the display would not begin to visibly deteriorate during that time. It took several minutes before one noticed any visible deterioration. And in fact, one could still make out the maze perhaps after ten or fifteen minutes, although one would begin to see the lines fading and broadening and the background coming slowly up after 10 or 15 minutes. And the normal total playing time for a game is only a minute or two.

Q Was there any capability in any of this apparatus to refresh the display so as to maintain it for a longer period of time than the normal storage period?

A Yes. If one had called for a specific graphic entity to be put on the screen, let's say a plot of a mathematical curve, and after several minutes one decided that it was no longer clear enough because of the fading that occurred in that kind of display, one could simply ask the computer to erase the screen and redraw that entity, because the computer had a stored list of the descriptions of that entity and could do so.

I believe it is your testimony that up to the end of 1952 there was no product offered for sale--I'm sorry, '72, I misspoke--that there was no product offered for sale by RCA which was related to

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this direct viewing interactive display using the storage tube. Could you tell me whether or not up to that time period there was any product offered for sale byRCA which used any kind of cathode ray tube display in which there was interaction between a user and the machine? And I don't want to limit the question, limit the inquiry to storage tubes, but cathode tube displays generally.

MR. TRIPOLI: You can answer the question for the period up to 1972, if you know the answer.

MR. GOLDENBERG: If you know, sir.

MR. TRIPOLI: I would like you not to speculate or guess.

A Yes.

Q Could you state what that device is, sir?

A There is specific device that I recollect, and that is the RCA 70/752 video display terminal, which was offered for sale and/or rental by RCA.

Could you describe generally the capabilities of that device and how it was used or how it would be used in a typical application?

A Yes. The device consisted of a typewriter-like keyboard, a cathode ray tube, black-and-white

an interface to a digital communications facility, which could be a telephone line or other interconnecting cable to another such display unit or through a computer. The general capability of the display -- I don't remember specific numbers now -was to put alpha numeric characters on the screen in conventional line-by-line fashion; that is, to make a page of text on the screen. And the device was used in conjunction with computers for timesharing applications to write and debug programs, to retrieve information from a computer, to enter information into the computer, to edit that information either before or afterit had been entered into the computer, typical time-sharing terminal computer applications.

cathode ray tube, and associated electronics, and

Could it display anything other than alpha numerics?

Not except in the sense that one can make a graphic entity by using a pattern of alpha numeric characters. So one could create a graphical image by putting zeroes and x's or other alpha numeric characters in appropriate positions on the screen, and from a practical point of view it would make no sense, but the eye would perceive it as a graphical entity.

Sir, do you know when that was first offered for sale by RCA, if you know?

I don't know the exact date. It was sometime during the 1960's.

What is your best recollection, sir? Q The latter part of the 1960's?

My best recollection would be the mid-1960's, '4, '5, '6.

Was that product developed at the RCA Princeton Laboratories?

No, it was not. A

Could you tell me where it was developed? Yes. It was developed at Van Nuys, California, at the RCA installation there. I don't remember the exact designation of that division at that time.

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Could the operator by exercising any kind of manual control determine the location on the face of this cathode ray tube as to where a particular symbol or alpha numeric might be?

There was a cursor, which was a small horizontal line that appeared beneath the location that the next character was to be entered. And the operator could sequence that cursor through the possible positions on the screen to locate the position where he wished to place the next character before striking the key that represented that character.

If I use the phrase raster scan, would you have any understanding as to what that meant in conjunction with a cathode ray tube display device?

Yes, I would.

Yes.

Could you tell me whether or not the Q RCA model 70/752, I believe you said--

> --used a raster scan? Q

> > I object to the question. MR. ANDERSON:

I think you should first let the witness state what he understands a raster scan to mean MR. GOLDENBERG: I would be perfectly

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happy to have him do that. I thank you for your suggestion, Mr. Anderson.

Could you do that, sir? 0

Yes, I could. Raster scan, in its usual interpretation means a scanning pattern repetitively of the beam on the screen, as is customarily done in the television application of cathode ray tubes. But in a more general sense, I believe most people would interpret raster scan to mean a repetitive tracing of the beam over the face of the screen in accordance with a specific predetermined pattern.

Could you now tell me, on the basis 0 of that understanding of raster scan, did that particular RCA apparatus use a raster scan display? In that sense, yes, it did. The beam started at the upper left-hand corner. It followed a complex motion thatinvolves three sets of repetitive It moved from left to right across a line. And while it moved across the line, it was caused to move up and down in a sinusoidal fashion a small distance relative to that line. When it reached the right-hand side of the screen, it would step down a certain distance, go back to the left and repeat that horizontal pattern with the small vertical motion superimposed on it. It's something

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that's sometimes referred to as a spot wobble type scan, but it was a raster scan in that sense, of the general definition of raster scan. But it was not the specific raster scan pattern that's used customarily in television.

> MR. GOLDENBERG: We have no further questions.

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RECROSS-EXAMINATION

BY MR. ANDERSON:

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The spot wobble type of system, from what you said, it sounds something like the person would actually write, making letters across a line by going up and down and left and right, as required, but moving across one line of text at a time. Is that essentially correct?

The spot wobble was a specific pre-No. determined pattern that was invariant. It was sinusoidal, so that as the beam moved across it would move up and down repetitively tracing the motion that's mathematically described by the function sign of X. The beam would be intensified at certain points during that motion in accordance with the pattern of the character that was to be displayed at that location on the screen. raster scan part of it was a fixed repetitive It was never changed in any way with the characters that were being displayed. The only thing that was changed with the characters being displayed was the intensity of the beam at different points during its tracing of this raster scan motion.

MR. ANDERSON: I understand.

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No further questions.

MR. GOLDENBERG: Mr. Lechner, thank you.

That completes your travail for the morning.

[Witness excused.]

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MR. GOLDENBERG: Mr. Tripoli, may we the same understanding that Mr. Lechner's signature will be waived, however, he will be permitted to read the transcript and point out to you anything that he believes was improperly transcribed and recorded, and that you will bring those to our attention and we will attempt between ourselves, that is you, I and Mr. Anderson, to agree upon those and to enter them in some appropriate fashion.

MR. TRIPOLI: Yes, that is agreeable to us.

That's fine. From what I MR. ANDERSON: have seen, the corrections I have in mind, just will be beyond contention. They don't require any reinterpretation of the testimony.

MR. GOLDENBERG: We will carry the original of the transcript and the original exhibits to Chicago with us and take responsibility for filing those in court.

MR. ANDERSON: That is acceptable.

MR. GOLDENBERG: With that, we are finished.

Thank you.

(The deposition was adjourned.)

CERTIFICATION

WE, GUY J. RENZI and EDWIN SILVER, Certified shorthand Reporters and Notaries Public of the state of New Jersey, do hereby certify the foregoing to be a true and accurate transcript of our original stenographic notes taken at the time and place hereinbefore set forth.

GUY J. RENZI, CSR

EDWIN SILVER, CSR

OCTOBER 28, 1976

MC Dougall. Hersh & Scott

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> Notice of Filing of Depositions Re: The Magnavox Company et al

Chicago Dynamic Industries, Inc., et al Civil Action Nos. 74 C 1030 and 74 C 2510

Gentlemen:

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THEODORE R. SCOTT

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JAMES P. RYTHER MELVIN M. GOLDENBERG CLARENCE J. FLEMING KEITH V. BOCKEY

WILLIAM T. RIFKIN

This will advise you that we have this day filed with the Clerk of the Court the ribbon copies of the following deposition transcripts taken in Trenton, New Jersey, October 26 and 27, 1976:

Alfred H. Teger

Harry L. Cooke

Bernard J. Lechner.

The depositions are filed subject to correction as agreed to by the parties.

Very truly yours,

WTR:ds

William T. Rifkin